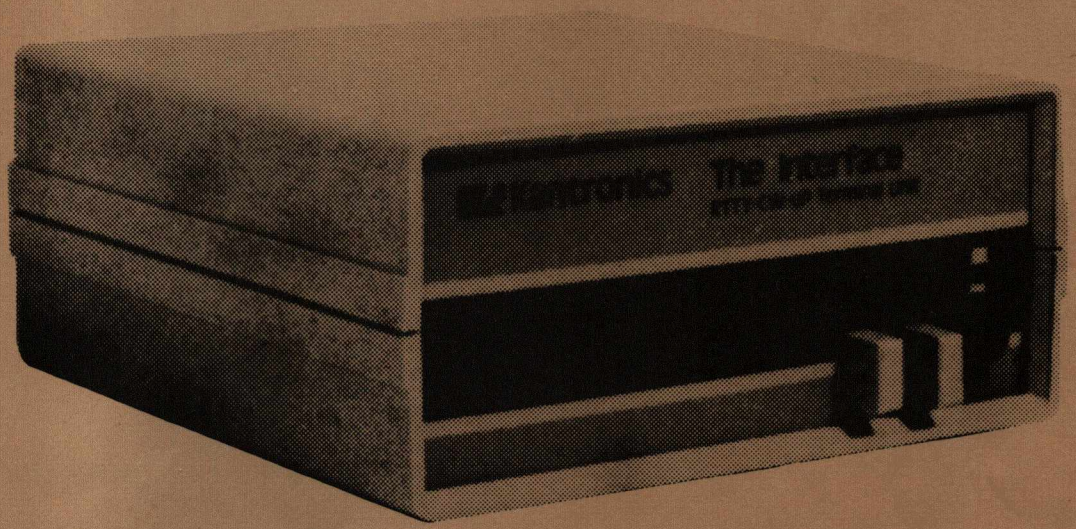
The Interface
Instruction Manual



Kantronics
(913) 842-7745
1202 E. 23rd Street
Lawrence, Kansas 66044

The Interface

Specifications

RTTY Receive.....	Active Filter.....	2295 Hz ' 180 Hz bandwidth
CW Receive.....	Active Filter.....	750 Hz ' 180 Hz bandwidth
RTTY Transmit.....	AFSK ' -27 to -53dBm...	2295 Hz space, 2125 Hz mark, shift off mark to 2175 Hz for CW-ID
CW Transmit.....	Direct or through buffered key	
Power Requirements..	8 to 15 VDC, minimum 150 ma	

INPUTS	CONNECTOR	SPECIFICATION
Audio In.....	3.5mm plug.....	70mv RMS minimum, Impedance 2.2k ohm or 8 ohms with speaker attached
External DC.....	2.1 or 2.5mm.....	8 to 15 VDC, at least 150 ma DC barrel plug center positive
Key In.....	3.5mm plug.....	TTL Compatible

OUTPUTS

Demod Out.....	3.5mm plug.....	TTL Compatible with open collector output ' 30 VDC Max.
Loop Out.....	3.5mm plug.....	MJE 340 open collector transistor 250 VDC Max.
Key Out.....	3.5mm plug.....	Transistor buffered -250 to +30VDC
AFSK Out.....	Mic-Jack pin 1.....	2295 Hz space, 2125 Hz mark, ' -27 t -53dBm (35-1.8mv RMS)
AFSK Shield.....	Mic-Jack pin 4.....	Ground
PTT Ground.....	Mic-Jack pin 3.....	Ground
PTT Out.....	Mic-Jack pin 2.....	Open Collector ' 30 VDC Max.

COMPUTER CONNECTIONS

Demod Out.....	TTL Compatible
Ground.....	Computer Ground reference
CW Key In.....	TTL Compatible
RTTY.....	AFSK control line, TTL compatible
CW-ID.....	AFSK control line, TTL compatible

INDICATORS-LED tuning eye and ten-segment LED bar graph

SIZE-approximately 2 1/2" X 5" X 5 1/4"

The Interface

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The Interface

Precautions

Please read through your operator's manual for this product before attempting to operate the unit. The warranty does not cover accidents incurred due to wiring not of Kantronics installation, or to use in violation of instructions provided by Kantronics.

Operator repairs or modifications automatically void The Interface warranty. Refer all repairs during the warranty period to Kantronics. Instructions for returning units to be repaired are included in this manual.

The Interface is a software dependent transceiver-computer modem. Kantronics does not warrant the use of software other than Hamsoft, by Kantronics. For complete information about software check the Software Guidelines section of this manual.

Introduction

The Interface is a highly sophisticated radio transceiver to computer terminal unit. With the Interface and a computer, your station becomes a complete CW/RTTY/ASCII station. And unlike before, CW operation using The Interface becomes almost RTTY like, utilizing your computer keyboard for CW output and the TV display for reception.

With The Interface, RTTY is sent and received at the standard audio frequencies; 2295 Hz space and 2125 Hz mark, with a CW-ID frequency shift off mark to 2175 Hz. With CW, reception is at 750 Hz and keying is the same as standard transmitter keying.

The Interface is one of four parts of your CW/RTTY/ASCII automated station. The other three parts are a transceiver, computer, and the software necessary to drive the computer. The computer in turn, controls The Interface and your transmitter.

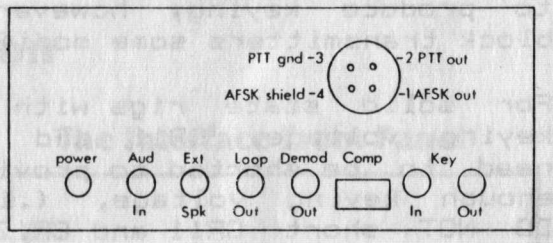
As software is an integral part of the total system, Kantronics has developed Hamsoft, computer software for use with The Interface. Hamsoft is available for many popular home computer systems, at an additional cost. Contact your local Kantronics dealer or the factory to inquire about existing software.

For software suggestions and ideas see the Software Guidelines section of this manual.

Hook-Up

The Interface is attached to your transceiver via jacks and connectors on its back panel. Referring to the back panel line drawing below, nine connections are possible; Power, Audio In, External Speaker, Loop Out, Demod Out, Computer, Key In, Key Out, and the Mic-Jack connection.

The Interface Back Panel



POWER-Attach power to the unit at the DC power jack. Any well filtered wall adapter with a 2.1 or 2.5mm DC barrel plug will provide sufficient power. The center is positive.

AUDIO IN-Attach a shielded audio cord with a 3.5mm plug to the Audio In jack of The Interface and the external speaker jack of the transceiver.

EXTERNAL SPEAKER-This jack is used to loop the audio through The Interface to an external speaker. Use a 3.5mm plug and shielded audio cable.

LOOP OUT-This jack provides the current necessary to drive Loop-Type teletype units. The user must provide the loop voltage. This jack is active during RTTY/ASCII transmission allowing both CRT monitoring and teletype operation simultaneously. See the Loop-Out/Teletype Connection section of this manual for specific connection instructions.

DEMOD OUT-This jack is a TTL compatible version of the Loop Out. Computer attachment for reception only, shortwave listening (SWL), can be accomplished by connecting the Demod Out 3.5mm plug from the back of The Interface to the Demod pin on your computer port. No other connection is necessary if SWL is the only requirement.

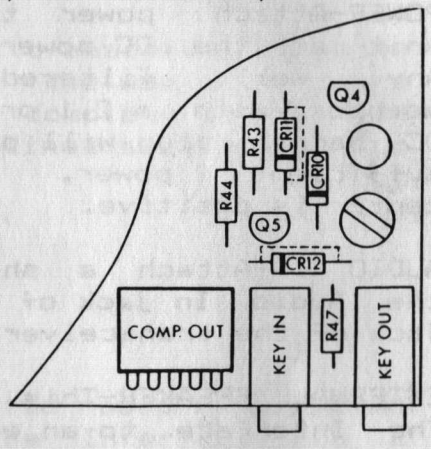
COMPUTER-This port consists of four control lines, and a ground, that the computer uses to control The Interface. The cable to attach this port to your computer is provided with Hamsoft, the Kantronics software. Be sure to use shielded cable when attaching to your computer. Make sure the shielded portion of the cable is attached to your computer's shielded ground. See the Computer Connection section of this manual for the functional definition of these control lines.

The Interface

KEY IN-If you wish to connect an electronic keyer or CW keyboard, it attaches to this jack. Use a 3.5mm plug.

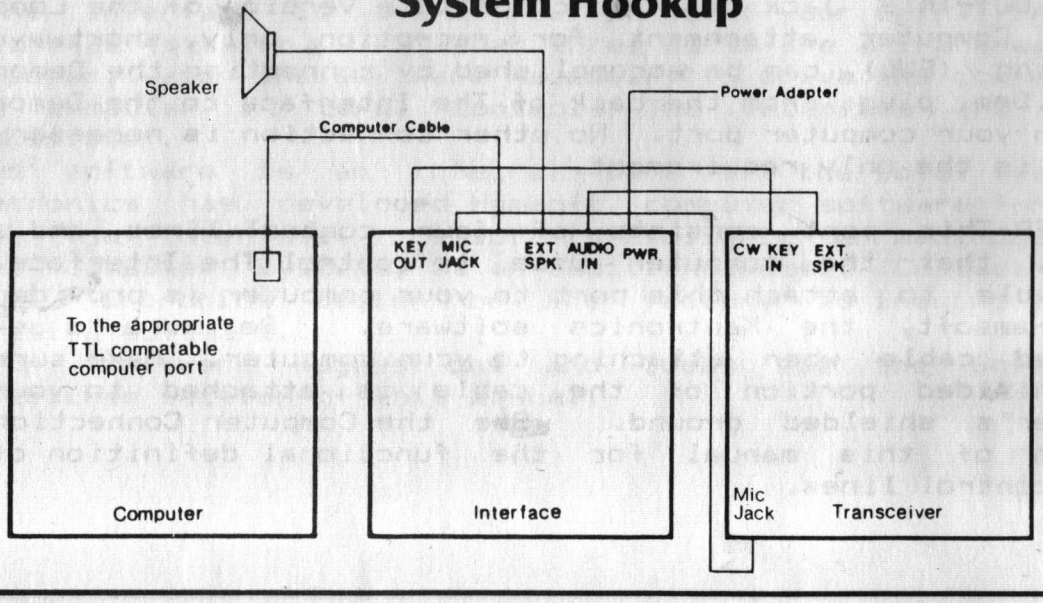
KEY OUT-This port carries the CW signal generated by the computer, or from the Key In jack, to the Key In of your transceiver. Computer keying of the Key Out jack may not work properly with a keyer attached simultaneously to the Key In jack of The Interface. Use a 3.5mm plug.
For most transmitters the voltage of Key Out is sufficient to produce keying; however, for some solid state or grid block transmitters some modification may be necessary.

For solid state rigs with positive keying voltage, CR11 and CR12 may need to be shorted to provide a low enough keying voltage, (.1 volts). DO NOT short CR11 and CR12 if your keying circuit has a negitive keying voltage. This will void the warranty. For grid block keying circuits, R44 may need to be reduced to provide sufficient current, do not reduce R44 below 100 ohms. (See diagram)



MIC-JACK CONNECTOR-The AFSK (Audio Frequency Shift Keying) and PTT (push-to-talk) lines connect here. These lines go from The Interface to your transceiver Mic-Jack. The PTT lines control the transmit/receive function and the AFSK lines are used to drive the audio input. You must use a shielded cable for at least the AFSK lines. Make sure that pin 1, AFSK out, is the center conductor and pin 4, AFSK

System Hookup

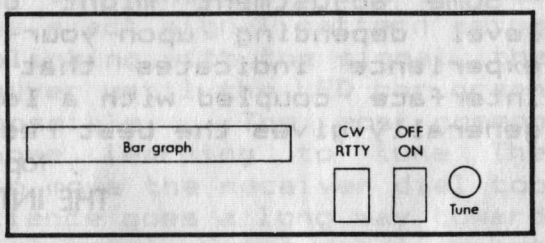


shield, is the shield. Standard audio cable or shielded cable can be used for PTT out, pin 2, and PTT ground, pin 3. It may be desirable not to run the PTT line inside the shield with the AFSK signal. A cable such as Belden 8734 would be suitable.
WARNING-Check your transceiver manual to correctly wire the correspoding pins of the transceiver mic-jack. Their assignment may be different.

Operation

The Interface is controlled by two front panel switches and computer lines attached to it via the computer jack on the back of the unit. The Interface is controlled entirely by the computer attached.

The Interface Front Panel



The Interface is a software dependent system requiring the proper computer program for operation. For information on software see the Software Guidelines section of this manual.

Tuning of RTTY or CW signals from your radio is facilitated by two LED indicators: the LED bar graph and the LED signal tuning eye.

FRONT PANEL SWITCHES/INDICATORS

POWER-Power is applied to the unit when the latching type power button is pressed in.

CW-RTTY-This latching type button will set The Interface receive filter to the low position, generally for CW, when left out. Pressed in, it will set the filter to its high position, usually for RTTY/ASCII.

TUNING LED-This rightmost single LED is used as an aid in tuning CW and RTTY signals; it is an actual indication of the Demod output.

LED BAR GRAPH-This ten segment LED is also used to tune CW and RTTY signals. See the Receiver Tuning section of this manual.

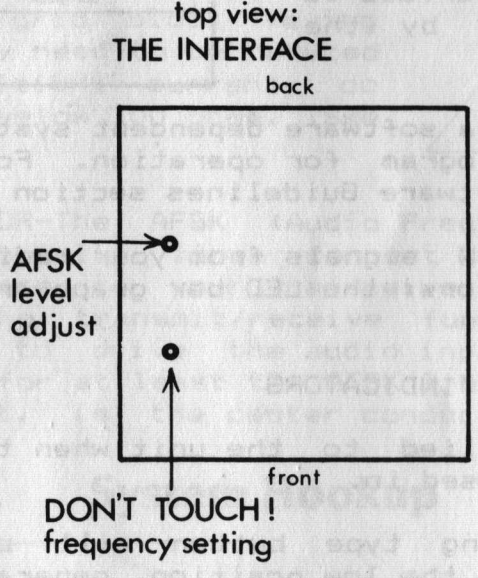
Mic-Gain Adjustment - AFSK

The AFSK two-tone generator in The Interface drives the Mic input of your transceiver. For best results, the audio level from this generator should be set as high as is practicable while maintaining a low audio gain level with your transmitter Mic gain control.

For this reason the AFSK audio level setting on The Interface on leaving the factory is about -27dBm to -53dBm (35mv -1.8mv RMS).

Please note that there are two pots; please leave the front pot unchanged. This sets your RTTY audio frequencies and is factory calibrated.

Some adjustment might be required in The Interface AFSK level depending upon your transmitter settings. Again, our experience indicates that a high audio level from The Interface coupled with a low transmit Mic gain (alc) setting generally gives the best results.



Receiver Tuning Procedures

One of the key elements to obtaining optimum results for The Interface is the method used to tune signals. A poorly tuned receiver will provide marginal results, while a well tuned receiver will provide much better results.

In preparation for tuning signals, the operator may want to open up any special filters his receiver has to their widest settings. The 180 Hz filter of The Interface has proven to work best over a variety of band conditions. After gaining experience with the unit, the operator may want to experiment with other filter settings for unusual band conditions. Remember to set the CW-RTTY front panel switch of The Interface to the proper position.

In the Morse mode, the operator tunes his receiver until a desired signal is heard. Once the signal is found, the operator should then watch the tuning eye and the LED bar graph of The Interface. While listening to the pattern of the incoming Morse signal, the operator should adjust his receiver, tuning the dial until the tuning eye and the LED bar graph begin to blink to the exact signal pattern being heard. Once the tuning eye is blinking with the signal, the operator should adjust the receiver until the LED bar graph lights as many segments as possible. The most common difficulty experienced by those learning to tune The Interface is that they tend to move the receiver dial too quickly. A little bit of patience goes a long way toward learning the process. If the signal is being received but not printing legibly on the screen display, depressing the CTRL-R command may remedy the situation.

Tuning radioteletype with The Interface is similiar to tuning Morse code signals, but requires a slightly different method. The operator should practice on a clean radioteletype signal that has little or no fading. The signal can be recognized by it's rapid, two-tone sound. The program should be set for RTTY 60 because that is the most common radioteletype speed.

Tune the receiver until the two-tone sound is low pitched, like CW. Then tune upward in frequency VERY SLOWLY while watching the tuning eye and LED bar graph. When the tuning eye begins to blink with the signal, the operator should stop. At that time text should begin to appear on the display screen. If the operator has hit just the edge of the copyable part of the signal, the bar graph will light only a few segments. To receive full copy the receiver dial should be adjusted higher in frequency until the bar graph lights a maximum number of segments. This process may need to be repeated once or twice, particularly under crowded band conditions. Again pressing the CTRL-R command after the signal is tuned in may give a readable display.

If The Interface does not decode the signal, the operator should cycle through the various speeds to determine if it is being sent at a faster rate. The operator may also find that in order to copy the signal he must switch to a different sideband. If you are having trouble copying a radioteletype signal on lower sideband, try upper sideband.

If the signal is still not copyable, there are several possible barriers, including too much interference for proper decoding, special coding of the signal by the transmitting station, inversion of the code, and transmission in a foreign language. In those cases the operator should probably try another signal.

Using LSB For Transmit/Receive

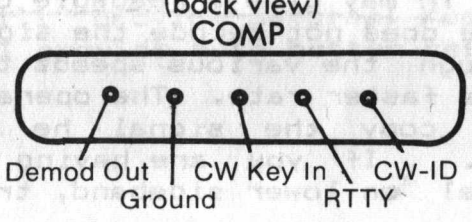
In practice LSB (lower side band) is used to receive single sideband on 80 and 40 meters, while USB (upper side band) is used to receive single sideband on 20 through 10 meters. However when receiving RTTY, LSB is used on all bands. This practice is used to properly reinvert the signal for reception.

Computer Connection

A five conductor cable connects The Interface and your computer. This cable is included with Hamsoft, the Kantronics software designed for use with The Interface. If you have the appropriate Hamsoft for your computer system, follow the instruction sheets included with the software for hook-up and operation.

KANTRONICS DOES NOT WARRANT THE USE OF THE INTERFACE WITH ANY OTHER SOFTWARE. However if you choose an alternate software the following information will be necessary for operation of The Interface.

A five pin port on the back of The Interface provides the connections necessary for attaching the unit to your computer. The physical positioning of these control lines is shown below. Looking from the back of the unit, left to right, they are; Demod Out, Ground, CW Key In, RTTY, and CW-ID.



These five lines are used to receive information from The Interface and to control it. The functions of the lines are as follows.

DEMOD OUT-This is the CW/RTTY/ASCII demodulator line that presents a processed TTL (transistor to transistor logic) receiver signal to your computer.

GROUND-This line references The Interface to your computer ground.

CW KEY IN-This line is used to present CW keying signals in TTL compatible form to The Interface from your computer for transmission.

RTTY and CW-ID-These two lines work in combination to control the AFSK frequencies and PTT output in The Interface.
Four combinations are possible:

RTTY high and CW-ID high
This places The Interface in the receive mode. The receive frequency is 2295 Hz for RTTY and 750 Hz for CW, depending on the position of the front panel CW/RTTY switch. PTT is off.

RTTY low and CW-ID low
In this position a 2125 Hz tone, mark, is generated and transmitted through the mic-jack connector of The Interface. PTT is on.

RTTY low and CW-ID high
In this position a 2175 Hz tone, CW-ID, is generated and transmitted through the mic-jack connector of The Interface. PTT is on.

RTTY high and CW-ID low
In this position a 2295 Hz tone, space, is generated and transmitted through the mic-jack connector of The Interface. PTT is on.

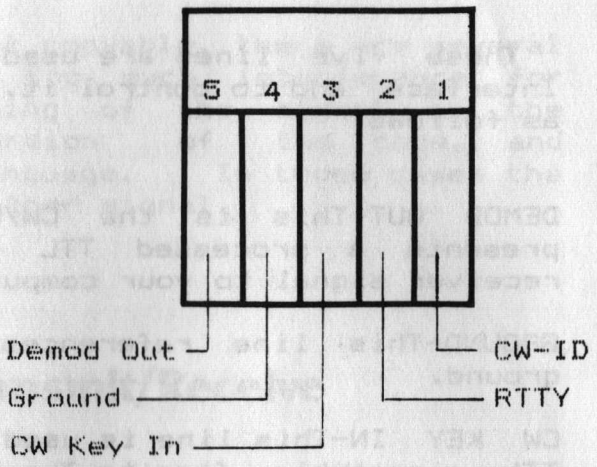
By toggling on and off one of the lines it is possible, with the proper computer program, to transmit the necessary tones for RTTY, CW-ID, and ASCII.

For example-Leaving the RTTY line in the low position and toggling the CW-ID line on and off will transmit CW-ID. Or by leaving the CW-ID line in the low position and toggling the RTTY line on and off will transmit RTTY/ASCII.

The Interface

If you plan on writing or using alternate software you can wire the five-pin crimp connector that is included with the package of connectors shipped with the unit.

We recommend Belden 9535 five conductor shielded cable be used. Any shielded five conductor cable will work, but the Belden cable can be ordered directly from the Kantronics factory. Use no larger than 24 AWG wire.



Strip the outer insulated shielded end of the cable, but do not strip the colored wires. Place the connector face up, with the open side up, and press the unstripped wires directly onto the pins in each of the five chambers. (See Diagram) Do not push the wires in from the end, but rather directly down onto the pins.

This connector is designed to break the insulation and contact the wires onto the pins. The connector is also keyed to fit the port of The Interface only one way.

Software Guidelines

The Interface does not come with software that is suitable for use with all home computers. This would be a nearly impossible task for our programmers and engineers.

However, Kantronics does have software, Hamsoft, available for many popular personal computers. This software features split screen display, status display, printer compatibility, message ports, and much more. Hamsoft is available on diskette for some computer systems and program boards for others. Contact you local Kantronics dealer concerning information about Hamsoft, or contact:

Kantronics
1202 E 23rd St.
Lawrence, Kansas 66044
913-842-7745

Kantronics does not warrant use of The Interface with software other than Hamsoft.

If you choose to use or write alternate software read the Computer Connection section of this manual for guidelines concerning the necessary physical connections between The

Interface, your transceiver, and computer. The cable for this connection is provided with Hamsoft, or can be purchased separately from Kantronics.

In addition, we recommend the following references for background and programming information:

SPECIALIZED COMMUNICATION TECHNIQUES, ARRL publication

RTTY HANDBOOK, 73 Magazine publication

THE RADIO AMATEUR'S HANDBOOK, ARRL publication

For CW;
"A Complete Morse Send/Receive Package for the AIM 65," by Marvin L DeJong, "Micro--the 6502 Journal," Feb. 1980

"A Morse Code Station Data Handler," by Bruce Filgate, BYTE Magazine, Oct. 1976

"If Only Sam Morse Could See Us Now," by Wayne Sewell, BYTE Magazine, Oct. 1976

COMPUTERS AND THE RADIO AMATEUR, by Dr. Phil Anderson, Prentice Hall Publication, 1982

Loop Out - Teletype Connection

The Loop-Out jack on the back of The Interface provides the current necessary to drive loop-type teletype units; however, the user must provide the supply.

In addition, if several units are placed in the loop The Interface must be the last connection because it provides a ground return. Further, it should be the only ground return.

Loop-Out is active during mark, CW-ID, or can toggle during reception. Loop-Out is open during reception of a space signal.

The current signal from the Loop-Out jack is not processed by the computer; therefore, no speed conversion can take place. For example: a RTTY 100 signal cannot be received by a RTTY 60 compatible teletype.

Return Procedures

Consult the limited warranty policy on the back cover of this manual for the service provisions offered by Kantronics at no charge. This warranty is considered to be in force only when the customer has submitted his completed warranty registration within 10 days of pruchase and when the stipulations of the warranty have been met. Violations of warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty will be charged at the cost of parts, labor and return shipping. Payment for repairs must be received before the repaired unit can be returned. Money order or cashier's check payment will speed the return of the unit by at least 10 days over payment of personal check.

When service or repairs appear necessary, it may be wise to call or write Kantronics to determine if the problem can be solved without returning the unit. When calling report the product name and ask for the amateur radio service department. When writing, include a clear description of the problem.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange must be approved with a return authorization number from Kantronics.

Kantronics will not approve the return of a product purchased from a dealership. Any return or exchange must be negotiated with the company it was purchased from.

RFI Control

This equipment has been tested and found to comply with the technical specifications in part 15 of FCC rules for a Class-B computing device, which are designed to provide reasonable protection against RF interference in a residential installation.

The nature of digital circuitry like that used in your computer is such that radio frequency interference is sometimes generated over short distances. Depending on many factors related to The Interface and its installation with your computer system, you may note some interference to your radio.

Interference can take the form of "birdies" that can be identified at different points up and down the band of your radio. Interference is generally low level and limited in the distance it can travel, so you may be able to clear up any problem by simply positioning The Interface and computer differently in relation to your radio. You may also try plugging The Interface into a different wall outlet so that it and the computer are on a different branch circuit than the radio.

Because The Interface contains only audio frequency circuits, any intreference encountered is due to the computer and/or the cabling from it to The Interface. Therefore, be sure to follow the hook-up procedures specified in this manual.

Be sure when using a standard TV that the rabbit ears or external antenna are not connected to the antenna terminals along with the computer video modulator or you may pick up additional interference.

If necessary, you could consult the dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet, by the FCC, helpful: "How to Identify and Resolve Radio-TV Interference Problems," available from the US Government Printing Office, Washington, D.C. 20402, stock number 004-000-00345-4.

Modifications

The Kantronics Interface is designed to work with most amateur transceivers with little or no modification. Due to different manufacturers specifications, such as different mic-jack connectors, some changes will be necessary by the operator. This is the reason the mic-jack cable is shipped incomplete. The operator must wire the approprite connector for his transceiver.

The following modifications are also necessary for the ICOM 720 and 730 transceivers.

AFSK Level - Due to the fact that the ICOM units use a microphone with a pre-amp, they require a higher level at the microphone input (i.e. 340 mvpp). Therfore the output

level of The Interface needs to be increased by the following modifications:

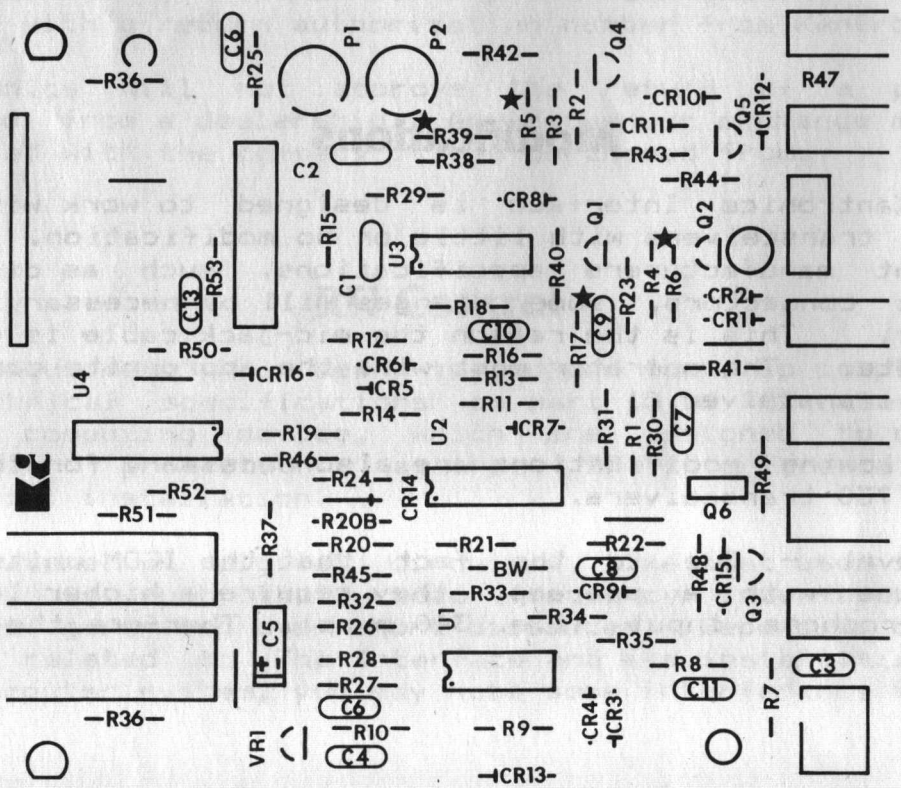
	Standard	Modification
R39	470k	56K
C 9	.01uf	.1uf

PTT Drive - The ICOM PTT circuit when closed will sink about 130ma in the ICOM 720 and 260ma in the ICOM 730. Consequently the open collector of The Interface must sink this same amount while remaining at or near saturation. All the newer Interface units, serial numbers 14434 and above, will satisfy this requirement in the ICOM 720, and will not require modification. Earlier units and those used with the ICOM 730 must be modified as follows.

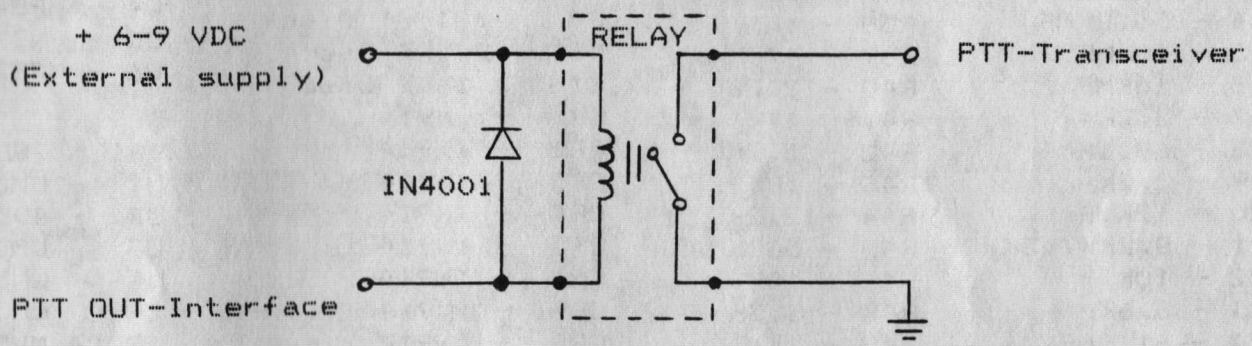
	Early Units	New Units/ICOM720	ICOM 730
R 5	2.2K	330 ohms	330 ohms
R 6	10K	2.2K	820 ohms

Also recommended on all Interface units used with the ICOM 700 series transceivers is the placement of a .01mf disc ceramic capacitor across the PTT lines on the Interface rear mic-jack connector. Specifically that would be the connector pins with the red and black wires (two top pins).

Component Placement Diagram



Modifications may also be necessary in some older style transceivers, such as Drake and Swan, that have an incompatible keying circuit. The Interface will not operate properly with the standard push-to-talk connection to these transceivers. To remedy this situation we recommend you place a relay in the line between The Interface and the transceiver on the PTT OUT line, pin 2. (See diagram)



We suggest you use a Radio Shack 6-9 volt DC miniature relay (part number 275-003) or equilivent. DO NOT use internal power from The Interface for the relay. Use power from an adapter or external power supply.

Modifications to Yeasu transceivers, such as the FT 101 E, FT 101 EE, and FT 101 EX, will also be necessary for proper keying of CW signals. The above relay should be placed in the KEY OUT line from The Interface to the transceiver. Again DO NOT use internal power from The Interface for the relay. Use power from an adapter or external supply.

Analog Board Parts List (PC-22A)

R1 - 100K
R2 - 100K
R3 - 3.3K
R4 - 10K
R5 - 330 ohms
R6 - 2.2K
R7 - 2.2K
R8 - 47K
R9 - 100K
R10 - 2.2K
R11 - 10K
R12 - 53.6KMF
R13 - 2.2KMF
R14 - 56.2KMF
R15 - 10KMF
R16 - 10KMF
R17 - 2.2K
R18 - 68.1KMF
R19 - 2.2K
R20 - 12KMF
R21 - 8.2K/7.5K
R22 - 10K
R23 - 5.6K
R24 - 61.9MF
R25 - 2.2K
R26 - 5.6K
R27 - 3.3K
R28 - 2.2K
R29 - 10K
R30 - 1 Meg
R32 - 47K
R32 - 22K
R33 - 10K
R34 - 330K
R35 - 10K
R36 - 180 ohms
R37 - 330 ohms
R38 - 1K
R39 - 470K
R40 - 2.2K
R41 - 47K
R42 - 2.2K
R43 - 10K
R44 - 2.2K
R45 - 560K
R46 - 10K
R47 - 3.3K
R48 - 1K
R49 - 330 ohms
R50 - 18K
R51 - 2.2K
R52 - 2K
R53 - 1 Meg
C1 - Inf NPO
C2 - Inf NPO
C3 - .01 uf Disc
C4 - .01 uf Disc
C5 - 4.7 uf ' 35V
C6 - .01 uf Disc
C7 - .01 uf Disc
C8 - .01 uf Disc
C9 - .01 uf Disc
C10 - 20 pf Disc
C13 - .1 uf Disc
CR1 - 1N914
CR2 - 1N914
CR3 - 1N914
CR4 - 1N914
CR5 - 1N914
CR6 - 1N914
CR7 - 1N914
CR8 - 1N914
CR9 - 1N914
CR10 - 1N4003
CR11 - 1N4003
CR12 - 1N4003
CR13 - 1N4003
CR14 - 1N914
CR15 - 1N4003
CR16 - 1N914

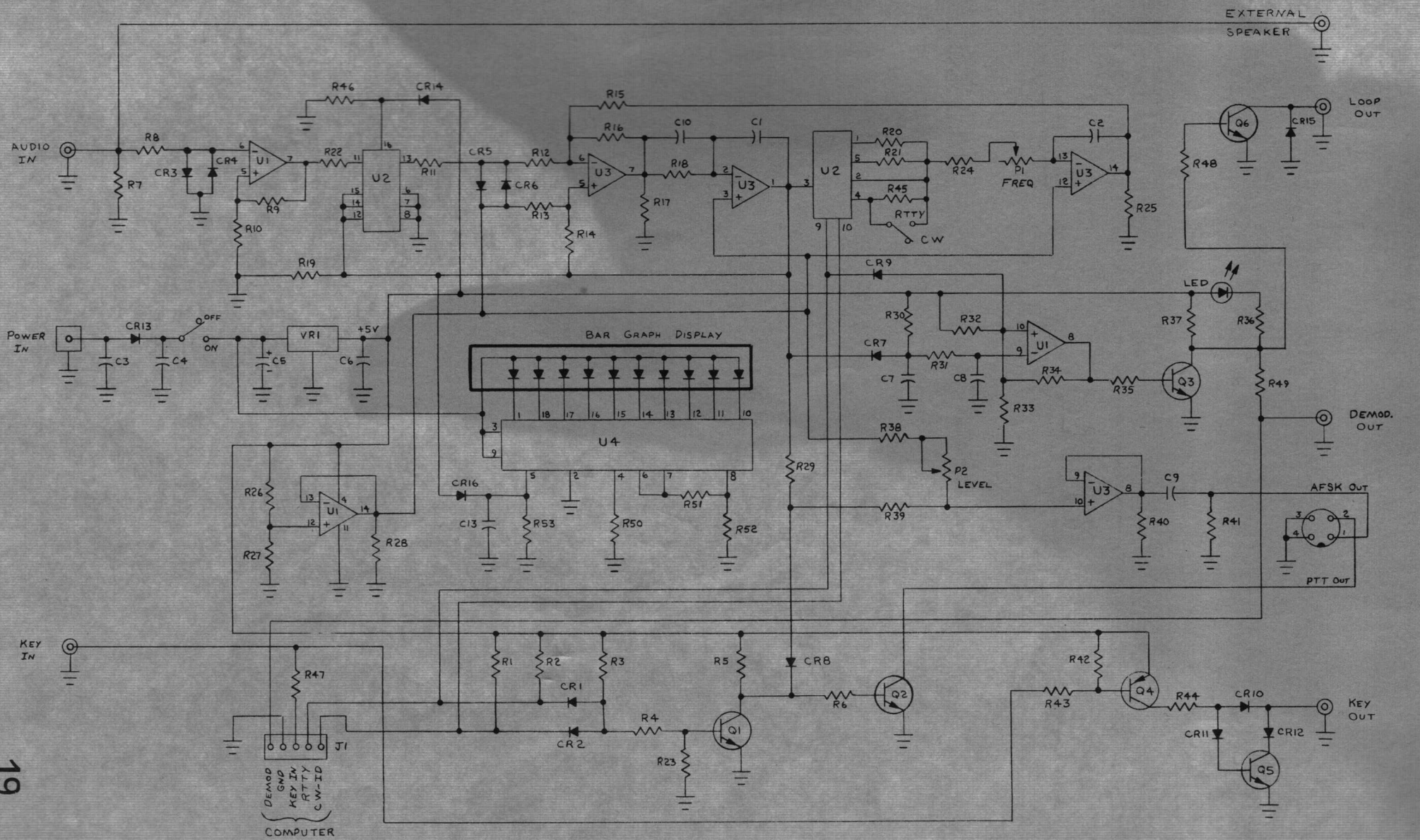
Q1 - PN2222
Q2 - PN2222
Q3 - PN2222
Q4 - MPSA92
Q5 - PN2222
Q6 - MJE340

VR1 - 78L05
U1 - LM324N
U2 - 4052
U3 - LM324N
U4 - LM3916N/ LM3914N
LED - MV5753

Limited Warranty

Kantronics Inc. warrants each new Interface to be free from defects in material and workmanship under normal use and service for a period of one year after delivery to the ultimate user. Kantronics will repair or replace The Interface, at our option, at no charge should it become defective and should our examination disclose The Interface to be defective under warranty.

This warranty shall not apply to any Interface that has been subject to misuse, neglect, accident incurred due to wiring not of our own installation, or to use in violation of instructions furnished by Kantronics. This warranty will not be extended to units that have been repaired or altered outside our facilities.

This warranty does not cover broken or cracked cabinets, or any accessory used in connection with The Interface. This warranty is in lieu of all other warranties expressed or implied, and no representative or person is authorized to assume for Kantronics any other liability in connection with the sale of its products.

Analog Board (PC-22A)